## Explosion och brand på en fabrik för produktion för pesticider.

**920116 MARS 1992_11**

Olyckan inträffade i ett vattenbad som användes för att förvärma tunnor med råmaterial till pesticidproduktionen. I strid mot driftbestämmelserna glömde en operatör att avbryta uppvärmningen av tunnorna. Uppvärmningen förlängdes med minst en timme vilket ledde till ett såpass stort övertryck att innehållet i tre tunnor exploderade. I den påföljande branden bildades svaveloxider, kväveoxider och merkaptaner. Branden resulterade i att ytterligare sex tunnor med dimethoate sprängdes. Branden släcktes inom 10 minuter av företagets interna brandkår. Räddningstjänsten anlände och hjälpte till med eftersläckningsarbetet.De lokala myndigheterna informerades omedelbart.

### Inblandade ämnen och mängder

| | CAS Nr. | Mängd |
|---|---|---|
| demethoate | 1113-02-6 | i branden 375 kg |
| demethoate | 1113-02-6 | i explosionen 1125 kg |
| svaveloxider, kväveoxider och merkaptaner | | totalt 1225 kg |
| parathion methyl | 298-00-0 | 1560 kg |

### Skador:

| | |
|---|---|
| Människor: | Blodprov togs på anställda för att undersöka eventuella effekter av dimethoate på cholinesteras i blodet. Inga effekter kunde upptäckas. |
| Materiella: | Omfattande skador på anläggningen. |
| Miljö/ekologi: | Då rapporten sammanställdes pågick fortfarande en juridisk utredning om huruvida allt det kontaminerade vattnet tagits om hand, eller om en del av det hällts ut i havet. |
| Infrastruktur: | Inga. |

### Erfarenheter redovisade (Ja/Nej): Ja.

Kortfattat anges förebyggande åtgärder.

# Report Profile

### Identification of Report:

**country:** FA **ident key:** 1992_011_01

**reported under** Seveso I **directive as** major accident **reports:** SHORT+FULL

### Date of Major Occurrence: Time of Major Occurrence

**start:** 1992-01-16 **start:** 11:40:00

**finish: finish:**

### Establishment:

**name:**

**address:**

**industry:** 2004 pesticides, pharmaceuticals, other fine chemicals

Pesticide

**Seveso II status: not applicable:** Yes **art. 6 (notification):** No

**art. 7 (MAPP):** No

**art. 9 (safety report):** No

### Date of Report:

**short:** **full:**

### Authority Reporting:

**name:**

**address:**

### Authority Contact:

**rep_cont_name:**

**rep_cont_phone:**

**rep_cont_fax:**

### Additional Comments:

**a)** - not applicable -

**b)** - not applicable -

**c)** - not applicable -

**d)** - not applicable -

**e)** - not applicable -

# Short Report

**country:** FA **ident key:** 1992_011_01

### Accident Types:

**release:** Yes **explosion:** Yes

**water contamination:** Yes **other:** No

**fire:** Yes

**description:**

ENVIRONMENTAL AND ATMOSPHERIC CONDITIONS:... see Appendix Short Report / description of accident types

### Substance(s) Directly Involved:

**toxic:** Yes **explosive:** Yes

**ecotoxic:** Yes **other:** No

**flammable:** Yes

**description:**

- Dimethoate (C.A.S. CODE: 1113-02-6): amount involved during the fire = 375 kg (the contents of three

barrels).... see Appendix Short Report / description of substances involved

### Immediate Sources of Accident:

**storage:** No **transfer:** No

**process:** Yes **other:** No

**description:**

The accident occurred in the water-bath used for pre-heating barrels of raw materials for a pesticide plant.

The water-bath (which approximate dimensions were 6 metres long, 2 metres large and 1.5 metres high) was used

to pre-heat barrels ... see Appendix Short Report / description of immediate sources

### Suspected Causes:

**plant or equipment:** No **environmental:** No

**human:** Yes **other:** No

**description:**

INITIATING EVENT AND CONSEQUENCES:... see Appendix Short Report / description of suspected causes

### Immediate Effects:

**material loss:** Yes

**human deaths:** No

**human injuries:** No **community disruption:** No

**other:** No

**ecological harm:** Yes

**national heritage loss:** No

**description:**

EFFECTS ON PEOPLE:... see Appendix Short Report / description of immediate effects

### Emergency Measures taken:

**on-site systems:** Yes **decontamination:** No

**external services:** Yes **restoration:** No

**sheltering:** No **other:** No

**evacuation:** No

**description:**

INTERNAL TO THE ESTABLISHMENT:... see Appendix Short Report / description of emergency measures taken

### Immediate Lessons Learned:

**prevention:** Yes **other:** No

**mitigation:** Yes

**description:**

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:... see Appendix Short Report / description of immediate lessons learned

# A Occurrence Full Report

**country:** FA **ident key:** 1992_011_01

### 1 Type of Accident

**remarks:** The overheating of a water-bath (used for pre-heating barrels of raw materials) caused the detonation of the caps of three barrels containing dimethoate (code 1301). As a result of the explosion, a fire of dimethoate occurred with subsequen... see Appendix Full Report A / type of accident

### 2 Dangerous Substances

**remarks:** The total establishment inventory of dimethoate refers to the 14 barrels (each containing 124 Kg of material) that were heating in the water-bath when the accident occurred. Only 9 barrels were involved in the explosions or in the fire. No ... see Appendix Full Report A / dangerous substances

### 3 Source of Accident

**illustration:** - not applicable -

**remarks:** The accident occurred in the water-bath (code 3104) used for pre-heating barrels (code 4003) containing raw materials for a pesticide plant (code 2004). The water-bath (which approximate dimensions were 6 metres long, 2 metres large and 1.5... see Appendix Full Report A / source of accident - remarks

## 4 Meteorological Conditions

**precipitation none: fog: rain: hail: snow:**

No No No No No

**wind speed (m/s):** 2

**direction (from):** West

**stability (Pasquill):** D

**ambient temperature (∞C):**

**remarks:** The wind direction was from West and its speed was about 2 m/sec. The Atmospheric Stability Class was "D".

## 5 Causes of Major Occurrence

**main causes**

**technical / physical** 5102 operation: component/machinery failure/malfunction

- not applicable -

- not applicable -

- not applicable -

- not applicable -

**human / organizational** 5303 organization: organized procedures (none, inadequate, inappropriate, unclear)

5307 organization: process analysis (inadequate, incorrect)

5308 organization: design of plant/equipment/system (inadequate, inappropriate)

5401 person: operator error

- not applicable -

**remarks:** Despite of the standard operating instructions for the pre-heating of dimethoate, the operator forgot to switch-off the steam valve (codes 5303 and 5401) heating up the water of the bath and the overpressure, due to the vapours produced in ... see Appendix Full Report A / causes of major occurrence

## 6 Discussion about the Occurrence

- not applicable -

## Type of Accident **country:** FA **ident key:** 1992_011_01

**event:**

**major occurrence** - not applicable -

**initiating event** - not applicable -

**associated event** - not applicable -

**event:**

**major occurrence** 1201 fire: conflagration (a general engulfment fire)

**initiating event** 1301 explosion: pressure burst (rupture of pressure system)

**associated event** - not applicable -

## Dangerous substances

**country:** FA **ident key:** 1992_011_01

### a) total establishment inventory

**CAS number: identity:** Sulphur Oxides

**name from Seveso I Directive:** - not applicable -

**name from Seveso II Directive:** - not applicable -

**category from Seveso II:** - not applicable -

**other hazards (1):** - not applicable -

**other hazards (2):** - not applicable -

**maximum quantity (tonnes):** -1

**use of substance as:** ABNORMAL PRODUCT

### b) substance belongs to relevant inventory directly involved: Yes

**actual quantity:** -1 **potential quantity:** -1

### c) substance belongs to relevant inventory indirectly involved: No

**actual quantity:** -1 **indir_pot_quant:** -1

### a) total establishment inventory

**CAS number:** 298-00-0 **identity:** Parathion Methyl

**name from Seveso I Directive:** - not applicable -

**name from Seveso II Directive:** - not applicable -

**category from Seveso II:** - not applicable -

**other hazards (1):** - not applicable -

**other hazards (2):** - not applicable -

**maximum quantity (tonnes):** 1,56

**use of substance as:** STARTING MATERIAL

### b) substance belongs to relevant inventory directly involved: Yes

**actual quantity:** -1 **potential quantity:** 1,56

### c) substance belongs to relevant inventory indirectly involved: No

**actual quantity:** -1 **indir_pot_quant:** -1

### a) total establishment inventory

**CAS number: identity:** Nitrogen Oxides

**name from Seveso I Directive:** - not applicable -

**name from Seveso II Directive:** - not applicable -

**category from Seveso II:** - not applicable -

**other hazards (1):** - not applicable -

**other hazards (2):** - not applicable -

**maximum quantity (tonnes):** -1

**use of substance as:** ABNORMAL PRODUCT

### b) substance belongs to relevant inventory directly involved: Yes

**actual quantity:** -1 **potential quantity:** -1

### c) substance belongs to relevant inventory indirectly involved: No

**actual quantity:** -1 **indir_pot_quant:** -1

### a) total establishment inventory

**CAS number: identity:** Mercaptans

**name from Seveso I Directive:** - not applicable -

**name from Seveso II Directive:** - not applicable -

**category from Seveso II:** - not applicable -

**other hazards (1):** - not applicable -

**other hazards (2):** - not applicable -

**maximum quantity (tonnes):** -1

**use of substance as:** ABNORMAL PRODUCT

### b) substance belongs to relevant inventory directly involved: Yes

**actual quantity:** -1 **potential quantity:** -1

### c) substance belongs to relevant inventory indirectly involved: No

**actual quantity:** -1 **indir_pot_quant:** -1

### a) total establishment inventory

**CAS number:** 1113-02-6 **identity:** Dimethoate

**name from Seveso I Directive:** - not applicable -

**name from Seveso II Directive:** - not applicable -

**category from Seveso II:** - not applicable -

**other hazards (1):** - not applicable -

**other hazards (2):** - not applicable -

**maximum quantity (tonnes):** 1,125

**use of substance as:** STARTING MATERIAL

### b) substance belongs to relevant inventory directly involved: Yes

**actual quantity:** 1,125 **potential quantity:** 1,75

### c) substance belongs to relevant inventory indirectly involved: No

**actual quantity:** -1 **indir_pot_quant:** -1

## Source of Accident - Situation **country:** FA **ident key:** 1992_011_01

### situation

**industry**

**inititating event** 2004 pesticides, pharmaceuticals, other fine chemicals

**associated event** - not applicable -

**activity/unit**

**major occurrence** 3104 process: physical operations (mixing, melting crystallizing, etc.)

**inititating event** 3104 process: physical operations (mixing, melting crystallizing, etc.)

**associated event** - not applicable -

**component**

**major occurrence** 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

**inititating event** 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

**associated event** - not applicable -

# B Consequences Full Report

**country:** FA **ident key:** 1992_011_01

## 1 Area concerned

**affected**

**extent of effects installation:** Yes

**establishment:** Yes

**off-site; local:** No

**off-site; regional:** No

**off-site; transboundary:** No

**illustration of effects** - not applicable -

**remarks** In the Original Report there is no evidence of significant effects outside the e... see Appendix

Full Report B / area concerned - remarks

## 2 People

**establishment popul. emergency personnel off-site population**

**total at risk** 8

**immediate fatalities**

**subsequent fatalities**

**hospitalizing injuries**

**other serious injuries**

**health monitoring**

**remarks** According the dispersion model developped by the Laboratory of Physics of the En... see Appendix

Full Report B / people

## 3 Ecological Harm

**pollution/contamination/damage of:**

**- residential area (covered by toxic cloud)** Suspected

**- common wild flora/fauna (death or elimination)** Suspected

**- rare or protected flora/fauna (death or elimination)** Suspected

**- water catchment areas and supplies for consumption or recreation** Suspected

**- land (with known potential for long term ecological harm or** Suspected

**preventing human access or activities)**

**- marine or fresh water habitat** Yes

**- areas of high conservation value or given special protection** Suspected

**remarks** When the Original Report was prepared, It was under juridical investigation if t... see Appendix

Full Report B / ecological harm

## 4 National Heritage Loss

**effects on:**

**- historical sites** not applicable **- historic monuments** not applicable

**- historic buildings** not applicable **- art treasures** not applicable

**remarks** No data available.

## 5 Material Loss

**establishment losses off site losses**

**costs (direct costs to operator) (social costs)**

**in ECU Greek Drachmaes ECU Greek Drachmaes**

**material losses 5000000**

**response, clean up, restoration**

**remarks** The cost of the material losses caused by the accident (damages to the waterbath... see Appendix

Full Report B / material loss

## 6 Disruption of Community Life

**establishment/plant evacuated disabled/unoccupiable destroyed**

**- nearby residences/hotels** No No No

**- nearby factories/offices/small shops** No No No

**- schools, hospitals, institutions** No No No

**- other places of public assembly** No No No

**interruption of utilities etc. no / yes duration**

**- gas** No

**- electricity** No

**- water** No

**- sewage treatment works** No

**- telecommunications** No

**- main roads** No

**- railways** No

**- waterways** No

**- air transport** No

**significant public concern none local level national level**

**- off site populations** Yes No No

**- media interest** No No No

**- political interest** No No No

**remarks** In the Original Report there is no evidence of significant effects outside the e... see Appendix

### 7 Discussion of Consequences

## Ecological Components involved

**country:** FA **ident key:** 1992_011_01

**type:** 6403 offshore: sea/seabed

**threatened:** not applicable **affected:** Yes

# C Response Full Report

**country:** FA **ident key:** 1992_011_01

### 1 Emergency Measures

**taken - on site** - not applicable - - not applicable -

- not applicable - - not applicable -

- not applicable - - not applicable -

**- off site** - not applicable - - not applicable -

- not applicable - - not applicable -

- not applicable - - not applicable -

**still - on site** - not applicable - - not applicable -

**required**

- not applicable - - not applicable -

- not applicable - - not applicable -

**- off site** - not applicable - - not applicable -

- not applicable - - not applicable -

- not applicable - - not applicable -

**continuing contamination or danger**

**-on site** not applicable

**-off site** not applicable

**remarks** - not applicable -

### 2 Seveso II Duties

**pre-accident evaluation**

**Article item not due yet not done done/submitted evaluated**

**6 notification** No No No No

**7 policy (MAPP)** No No No No

**9 safety report** No No No No

**9, 10, 11 update** No No No No

**11 internal plan** No No No No

**11 external plan** No No No No

**13 informing public** No No No No

**9, 12 siting policy** No No No No

**post-accident evaluation**

**Seveso II duty was actual were actual compared with actual**

**contingency consequences consequences, the**

**addressed? addressed? predicted extent was?**

**Article item**

**7 policy (MAPP)** not applicable not applicable not applicable

**9 current safety report** not applicable not applicable not applicable

**11 internal plan** not applicable not applicable not applicable

**11 external plan** not applicable not applicable not applicable

**13 informing public** not applicable not applicable not applicable

**9, 12 siting policy** not applicable not applicable not applicable

**evaluation of safety organisation**

**organisational element element existed did element relate to actual circumstances of**

**yes / no no / partly / yes adequate?**

**- written policy objectives** No

**- specified management** No

**structure**

**- specified responsibilities** No

**- specified working procedures** No

**- specified procedures for** No

**assessment/auditing of**

**management system**

**- specified procedures for** No

**review and update of**

**management policy**

**- specified general training** No

**procedures**

**- specified emergency** No

**training procedures**

**evaluation of ecological impact control**

**organisational element element existed did element relate to actual circumstances of**

**yes / no no / partly / yes adequate?**

**- ecological status review** No

**before incident**

**- potential ecological** No

**consequences assessment**

**- ecological impact review** No

**after incident**

**- ecological restoration** No

**procedures**

**- subsequent review of** No

**restoration success**

**remarks** - not applicable -

### 3 Official Action Taken

**legal action**

- not applicable -

**other official action**

- not applicable -

### 4 Lessons Learned

**measures to prevent recurrence**

After the accident the followi... see Appendix Full Report C / lesson learned - prevent

**measures to mitigate consequences:**

After the accident, a new syst... see Appendix Full Report C / lesson learned - mitigate

**useful references:**

According to the dispersion mo... see Appendix Full Report C / lesson learned - references

### 5 Discussion about Response

- not applicable -

# Appendices for the FA / 1992_011_01 report

## Appendix Short Report / description of accident types:

ENVIRONMENTAL AND ATMOSPHERIC CONDITIONS:

Direction of wind: West. Atmospheric Stability Class: D. Wind speed = 2m/sec (data given by the company).

The accident happened between 11:40 and 11:50 am at the upper level of the building at the pesticide plant, in the water-bath used for pre-heating barrels of raw materials. The day of the accident dimethoate (14 barrels each containing 125 kg of material) and parathion-methyl (6 barrels each containing 260 kg of material) had to be heated . Despite of the standard operating instructions, the operator forgot to switch-off the steam valve of the line heating up the water of the bath. Thus, the heating time of the water of the bath and of the barrels was extended for at least one hour. As a result of the overheating, the overpressure generated by the vapours production, caused the detonation of the caps in three barrels containing dimethoate. As a result of the explosion, a fire of dimethoate occurred with subsequent emission of NOx, SOx and mercaptans. The fire was then followed by the detonation of the caps in other six barrels containing dimethoate.

It is under juridical investigation if the water used to extinguish the fire was totally treated in the waste water treatment plant and in the pool made out of gypsum and limestone or if it was partly released to the sea.

## Appendix Short Report / description of substances involved:

- Dimethoate (C.A.S. CODE: 1113-02-6): amount involved during the fire = 375 kg (the contents of three barrels).

- Dimethoate (C.A.S. CODE: 1113-02-6): amount involved during the explosion = 1125 kg (the contents of nine barrels).

- Dimethoate, SOx, NOx and Mercaptans: amount involved = 1225 kg (the contents of nine barrels). It is under juridical investigation if the extinguished water was partly released to the sea or it was treated totally in the wastewater treatment plant and in the pool made out of gypsum and limestone..

- Parathion-Methyl (C.A.S. CODE: 298-00-0): amount involved = 1560 Kg (the contents of 6 barrels). The six barrels of Parathion-Methyl were not directly involved in fire and in following explosions._

## Appendix Short Report / description of immediate sources:

The accident occurred in the water-bath used for pre-heating barrels of raw materials for a pesticide plant. The water-bath (which approximate dimensions were 6 metres long, 2 metres large and 1.5 metres high) was used to pre-heat barrels of raw materials. The pre-heating at 40˚50¯C of the contents of these barrels was made by means of hot water which in turn was directly heated by steam supplied by a steam coil. The plant stopped working on January 16, 1992 and started to work again on March 3, 1992.

## Appendix Short Report / description of suspected causes:

INITIATING EVENT AND CONSEQUENCES:

The overheating of the water-bath caused the detonation of the caps in three barrels (each containing 125 kg of dimethoate) and afterwards a fire. The fire was then followed by the detonation of the caps of other six barrels containing dimethoate.

CAUSES:

When the Original Report was prepared, the accident was under juridical investigation. At that moment, the current analysis of causes was the following:

According to the process specification and to the standard operating procedures, the pre-heating of the dimethoate was carried out in the water-bath at 40˚50¯C with a residence time of 2˚2.5 hours. Despite of the standard operating instructions, the operator forgot to switch-off the valve of the steam heating up the water of the bath, thus extending residence/heating time for at least one hour. As a result of the overheating, the overpressure generated by the vapours production in the closed barrels, caused the detonation of the caps of three barrels.

## Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

According the dispersion model developped by the Laboratory of Physics of the Environment of the Thessaloniki University, the combustion products of dimethoate reached (for SOx) a maximum concentration of 1.75 mg/mc at a distance of 100 metres from the water-bath (the maximum permissible concetration in the working environment is 5.32 mg/mc). Blood tests were carried out for the plant operators (dimethoate reduces the cholinesterase in the blood) but no effects were detected.

MATERIAL LOSS:

The cost of the material losses caused by the accident (damages to the waterbath, the cables of the fan and loose of the contents of 20 barrels) has been evaluated in about 5,000,000 of drachmaes..

ECOLOGICAL HARM:

When the Original Report was prepared, It was under juridical investigation if the water used to extinguish the fire was totally treated in the wastewater treatment plant and in the pool made out of gypsum and limestone or was partly released to the sea.

## Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

The fire was extinguished in 10 minutes by 10 people working in the company. As the fire was extinguished, three fire cars with 15 firemen from the Fire Brigade arrived and helped the personnel of the company.

EXTERNAL TO THE ESTABLISHMENT:

Local authority was immediately notified as well as environmental and other authorities. In order to avoid pollution of sea water by fire fighting extinguishing water, since its flow rate was too high and the pump which had to send it to the main waste water treatment plant was not adequate, the overflow was trapped in a pool made out of gypsum and limestone.

## Appendix Short Report / description of immediate lessons learned:

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident the following measures were established:

1- the heating system of the water-bath was replaced by a new one whereby steam is heating water in a closed circuit and hot water is used to heat the water in the water-bath via a heat-exchanger. Both systems are controlled against high temperature by special systems which do not allow the water temperature in the bath to exceed the required temperature;

2- the barrels during placing in the water-bath have to be protected so that they do not come into contact with heat-exchanger tubes;

3- the water in the water-bath is recycled to obtain homogeneous degree of heating.

MEASURES TO ALLEVIATE THE EFFECTS OF THE ACCIDENT:

After the accident, a new system was installed to ensure that, in case of fire, the extinguishing water is collected and safely neutralized.

## Appendix Full Report A / type of accident:

The overheating of a water-bath (used for pre-heating barrels of raw materials) caused the detonation of the caps of three barrels containing dimethoate (code 1301). As a result of the explosion, a fire of dimethoate occurred with subsequent emission of NOx, SOx and mercaptans (code 1401). The fire then was followed by the detonation of other three barrels (code 1301). It is under juridical investigation if the water used to extinguish the fire was partly released to the sea (code 1405).

## Appendix Full Report A / dangerous substances:

The total establishment inventory of dimethoate refers to the 14 barrels (each containing 124 Kg of material) that were heating in the water-bath when the accident occurred. Only 9 barrels were involved in the explosions or in the fire. No data are available about the NOx, SOx and mercaptans produced by the fire of dimethoate. The 6 barrels containing parathion- methyl were not involved in the accident.

## Appendix Full Report A / source of accident - remarks:

The accident occurred in the water-bath (code 3104) used for pre-heating barrels (code 4003) containing raw materials for a pesticide plant (code 2004). The water-bath (which approximate dimensions were 6 metres long, 2 metres large and 1.5 metres high) used hot water which in turn was directly heated by steam supplied by a steam coil. The location of the plant is shown on a map attached to the Original Report.

## Appendix Full Report A / causes of major occurrence:

Despite of the standard operating instructions for the pre-heating of dimethoate, the operator forgot to switch-off the steam valve (codes 5303 and 5401) heating up the water of the bath and the overpressure, due to the vapours produced in the closed barrels, caused the detonation of the caps of three barrels (code 5102). The plant design and process analysi were inadequate because the heating of the water bath was carried out directly with steam and not with hot water (codes 5307 and 5308).

## Appendix Full Report B / area concerned - remarks:

In the Original Report there is no evidence of significant effects outside the establishment. According to dispersion model of the Laboratory of Physics of the Environment of the University of Thessaloniki), the products of combustion (SOx, NOx) of dimethoate reached, for SOx, a maximum concentration of about 1.75 mg/mc at a distance of 100 metres from the site of the accident (the maximum permissible concentration of SOx in the working environment is about 5.32 mg/mc).

## Appendix Full Report B / people:

According the dispersion model developped by the Laboratory of Physics of the Environment of the Thessaloniki University, the combustion products of dimethoate reached (for SOx) a maximum concentration of 1.75 mg/mc at a distance of 100 metres from the water-bath (the maximum permissible concetration in the working environment is 5.32 mg/mc). Blood tests were carried out for the plant operators (dimethoate reduces the cholinesterase in the blood) but no effects were detected.

## Appendix Full Report B / ecological harm:

When the Original Report was prepared, It was under juridical investigation if the water used to extinguish the fire was totally treated in the waste water treatment plant and in the pool made out of gyspum and limestone or if it was partly released to the sea.

## Appendix Full Report B / material loss:

The cost of the material losses caused by the accident (damages to the waterbath, the cables of the fan and loose of the contents of 20 barrels) has been evaluated in about 5,000,000 of drachmaes.

## Appendix Full Report B / disruption of community life:

In the Original Report there is no evidence of significant effects outside the establishment.

## Appendix Full Report C / lesson learned - prevent:

After the accident the following measures were established:

1- the heating system of the water-bath was replaced by a new one whereby steam is heating water in a closed circuit and hot water is used to heat the water in the water-bath via a heat-exchanger. Both systems are controlled against high temperature by special systems which do not allow the water temperature in the bath to exceed the required temperature;

2- the barrels during placing in the water-bath have to be protected so that they do not come into contact with heat-exchanger tubes;

3- the water in the water-bath is recycled to obtain homogeneous degree of heating.

## Appendix Full Report C / lesson learned - mitigate:

After the accident, a new system was installed to ensure that, in case of fire, the extinguishing water is collected and safely neutralized.

## Appendix Full Report C / lesson learned - references:

According to the dispersion model developped by the Laboratory of Physics of the Environment of the University of Thessalonikiand taking into account the amount involved in the accident and the meteorological data, the combustion products of dimethoate reached a maximum concentration (for SOx) of 1.75 mg/mc at a distance of 100 metres from the installation (the maximum permissible concentration of SOx in the working environment is about 5.32 mg/mc).